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C-A OPERATIONS PROCEDURES MANUAL

2.6.2 Procedure for Partial Lockout/Tagout (LOTO) for Apparatus Testing in the AGS and Booster Rings During Accelerator Operations/Maintenance

Text Pages 2 through 8

Attachments

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Collider-Accelerator Department Chairman Date

P. Ingrassia

2.6.2 Procedure for Partial Lockout/Tagout (LOTO) for Apparatus Testing in the AGS and Booster Rings During Accelerator Operations/Maintenance

1. Purpose

1.1 This procedure provides instructions to Operations Coordinators (OC), Main Control Room (MCR) Operators, and CAS Technicians, when any apparatus listed in C-A-OPM 2.6.1, is not LOTO, AND personnel are required to work in the AGS and/or Booster Accelerator enclosures with the assurance that electrical hazards have been secured or properly barriered.

1.2 C-A Policy states that the preferred method to protect workers from energy sources is LOTO. However, this procedure is required to enable testing under applied power conditions.

1.3 The following Alternate means to LOTO include:

1.3.1 barriers to protect personnel from the hazards, and

1.3.2 Energized Circuit Work Permits to advise personnel of the hazards.

Caution:
This procedure is only to be applied to the AGS and Booster Rings.

1.4 This procedure shall be invoked when workers are required to:

1.4.1 Work in the ring enclosure while some equipment is energized for testing.

1.4.2 Access the ring enclosure for an inspection of apparatus that is not physically connected to or on the inside of the accelerator.

2. Responsibilities

2.1 The OC shall:

2.1.1 inform the MCR Operators or CAS Technicians, which devices on the checklist are not to be LOTO (see C-A-OPM 2.6.1);

2.1.2 designate two MCR Operators, or CAS Technicians, one as the Responsible Authorized Person (RAP) and the other as the Safety Watch Verifier (SWV);

2.1.3 issue Energized Circuit Work Permit (C-A-OPM-ATT 2.6.2.a);

2.1.4 attempt to limit the number of work permits and entries into the enclosures;

2.1.5 instruct systems specialists to erect appropriate barriers before permitting the testing of apparatus.

2.2 The MCR Operator shall:

2.2.1 when designated, act as the RAP or SWV to perform LOTO for the AGS and/or Booster Rings;

2.2.2 when designated, verify, that apparatus to be energized is properly barriered;

3. Prerequisites

3.1 Before equipment may be energized with workers in the enclosure, approval shall be obtained from the Operations Coordinator.

3.1.1 Before issuing approval to energize equipment with workers in the enclosure, the Operations Coordinator shall carefully evaluate the hazards, the proposed LOTO, and the number and training of personnel working in the enclosure.

3.2 Before issuing an energized Work Permit the OC shall inspect or designate an MCR Operator or CAS Technician to inspect the barriers for any apparatus that is to remain energized when personnel enter the accelerator enclosure.

3.3 Each System Specialist shall obtain OC approval to energize apparatus for testing when the AGS or Booster rings are in controlled or restricted access conditions.

3.4 Training prerequisites of importance for all workers:

3.4.1 Valid C-A Access Training on BTMS Listing is the minimum training requirement for workers who wish to enter the Booster or AGS ring enclosures under the following Controlled Access Conditions:

3.4.1.1 any of the Controlled Access Checklist from C-A-OPM 2.6.1 are used for LOTO AND every item on the list is LOTO,

3.4.1.2 entrants will only observe or advise other workers,

3.4.1.3 entrants will not work on apparatus physically attached to the accelerator, or connected to the vacuum chamber (except for the rf system).

Under these conditions, a lock need not be applied to the Token Box by the ring entrant.

3.4.2 Valid Lockout/Tagout training, valid Electrical Safety training and, valid C-A Access training on BTMS Listing, are the minimum training requirements for workers entering the Booster or AGS ring enclosures under the following conditions:

3.4.2.1 Any of the Controlled Access Checklists from C-A-OPM 2.6.1 are used for the LOTO AND every item on the list is LOTO.

3.4.2.2 Entrants will work on apparatus attached to the accelerator or vacuum chambers.

Under these conditions, a lock shall be applied to the Token Box by the ring entrant.

3.4.3 Valid Lockout/Tagout training, and valid Electrical Safety Training and valid C-A Access Training on BTMS Listing, are the minimum training requirement for workers entering the Booster or AGS enclosures under the following conditions:

3.4.3.1 Some apparatus from the C-A-OPM Controlled Access LOTO checklist remains energized.

Under these conditions, a lock shall be applied to the Token Box by the ring entrant and the entrant shall carry an Energized Circuit Work Permit (C-A-OPM-ATT 2.6.2.a) issued by the Operations Coordinator.

3.4.4 Valid Lockout/Tagout training, valid Electrical Safety training, and valid Working Hot Training and valid C-A Access Training on BTMS Listing, are the minimum training requirements for workers entering the Booster or AGS ring enclosures under the following conditions:

3.4.4.1 Only the Main Magnet Power Supply has been LOTO.

Under these conditions, a lock shall be applied to the Token Box by the ring entrant and the entrant shall carry an Energized Circuit Work Permit (C-A-OPM-ATT 2.6.2.a) issued by the Operations Coordinator.

3.4.5 Valid Lockout/Tagout training, valid Electrical Safety training and valid Working Hot training and valid C-A Access Training on BTMS Listing, as well as training in the tasks specified in the range D Working Hot Permit, are the minimum training requirements for workers entering the Booster or AGS ring enclosures under the following Controlled Access conditions:

3.4.5.1 The ring main magnets are energized.

Under these conditions, the entrants shall carry a work specific Range D Working Hot Permit.

4. Precautions

4.1 Precautions for the OC:

4.1.1 The appropriate LOTO Checklist in C-A-OPM 2.6.1 shall be used to ensure personnel safety against electrical hazards even when some apparatus remains energized for testing.

4.1.2 Apparatus on these checklists shall be unlocked by the MCR Operators or CAS Technicians and energized by the System Specialist only with the concurrence of the OC and under restrictions outlined in the table below.

	Number of Apparatus NOT LOTO Permitted		OPM LOTO Checklists
Access Control State	**Distributed Systems**	**Local Apparatus**	**To Choose Apparatus From**
IF Controlled Access THEN	one string and rf	four maximum	ALL (para 3.4.5 for BLW)
IF Restricted Access THEN	rf system	three maximum	2.6.1 att b&d + 2.6.4

4.1.3 No more than five Energized Circuit Work Permits may be issued at one time, per accelerator during Controlled Access. NO Energized Circuit Work Permits are needed during Restricted Access – Barriers are sufficient owing to the decreased hazard of the apparatus allowed to be energized.

4.1.4 Permits issued to inspection personnel listed in Attachment 8.2, shall not be considered as part of the total of Energized Circuit Work Permits.

Caution:
To assure electrical safety for workers when apparatus is to be energized, barriers must be erected prior to removal of LOTO and prior to issuing energized work permits.

4.1.5 When only the AGS main magnet power supply (MMPS) is locked and tagged during Controlled Access State, workers with Energized Circuit Work Permits shall be permitted to enter only to:

4.1.5.1 To make a visual inspection of apparatus from the outside aisle, or

4.1.5.2 To reset an RF Power amplifier

4.1.5.3 To clear a water mat indication from a beam transport line eg. SEB C line, FEB U line. or BtA.

Note:
Two persons, one a SWV, shall be the minimum number to enter the ring.

4.1.6 Entry into an accelerator with the MMPS not in LOTO and/or energized is permitted if a reviewed and valid Working Hot Permit for a Range D Hazard is presented to the OC.

Note:
This Permit shall be signed by the Chief Electrical Engineer (CEE), or the ES&H Coordinator.

4.1.6.1 A minimum of two persons, listed on the Range D permit, one acting as a Safety Watch (SW), shall enter the ring and follow the specific provisions of the Range D procedure. The SW shall be qualified in CPR.

4.2 Access into the C-A, with all apparatus energized, is permitted if access is made via the north conjunction gate and entrants do not go beyond the buoys used for shielding or access is made via the south gate and entrants do not go beyond the sump at the bottom of the ramp.

4.2.1 An energized circuit Work Permit (C-A-OPM-ATT 2.6.2.a) will be issued for such an access.

4.2.2 A Range D Working Hot Permit or a specific task procedure is not required for this case.

4.2.3 Two persons, one an MCR operator, shall enter the enclosure. The operator shall prevent any access beyond the shielding buoys.

4.2.4 The training requirements of paragraph 3.4.5 shall be invoked.

5. Procedure

5.1 Procedure for the Operations Coordinator

5.1.1 For the purpose of access, select the state of the Access Control System (ACS) based upon Operations requirements and the requirements of the work to be done in the enclosures.

5.1.2 Instruct the MCR operators or CAS Technicians to perform LOTO using the appropriate checklist from C-A-OPM 2.6.1.

5.1.2.1 IF some apparatus is to be tested THEN instruct the RAP to lock the keys to the safety locks for the apparatus that will be tested IN THE SUPPLEMENTARY LOCK BOX and lock the remaining keys into the LOCK BOX.

5.1.2.2 IF an entry is to be made under minimal lockout conditions, THEN instruct the RAP to lock the appropriate keys to the safety locks into the Lock Box.

5.1.3 IF workers are to enter the enclosure under Controlled Access AND some apparatus will remain not LOTO THEN verify the training of all entrants using paragraph 3.4.5 for guidance.

5.1.4 IF apparatus will be tested while workers are in the enclosure THEN:
5.1.4.1 Review the Precautions given in Section 4 of this procedure.

5.1.4.2 Instruct the systems specialist to barrier the apparatus.

5.1.4.3 Instruct an Operator or CAS Technician to inspect the barrier.

5.1.4.4 WHEN the barrier is acceptable, THEN

5.1.4.4.1 instruct the RAP to unlock the SUPPLEMENTARY LOCK BOX,

5.1.4.4.2 remove the keys to the safety locks for the apparatus to be tested,

5.1.4.4.3 re-lock the SUPPLEMENTARY LOCK BOX

5.1.4.4.4 remove LOTO from apparatus to be tested using the keys from the SUPPLEMENTARY LOCK BOX.

5.1.4.5 Issue Energized Circuit Work Permits (C-A-OPM-ATT 2.6.2.a) to every work team that enters the enclosure (limit 5 permits per accelerator).

5.1.4.5.1 During Restricted Access NO Energized Circuit Work permits need be issued. Apparatus that appears only on the Restricted Access LOTO Checklist may be energized under these conditions.

These power supplies present a decreased hazard compared to power supplies on the Controlled Access LOTO list. Barriers must be erected before any testing takes place with personnel in the enclosure.

5.1.4.6 Follow the guidance given in the table in paragraph 4.1.2 when determining how many items may be energized simultaneously.

5.1.4.7 when the MMPS is not LOTO, verify that each entrant is listed on the
range D work permit,

5.1.4.8 collect these permits (Attachment 8.1) when a worker/team has completed their task and inform the OC.

5.1.4.9 forward the permits to the persons called for at the bottom of the permit

Note:
IF powered back-leg windings (BLW) will be energized, THEN the table in paragraph 4.1.2 states that the training of all entrants shall comply with paragraph 3.4.5.

6. Documentation

6.1 Appropriate Checklist filled out from C-A-OPM 2.6.1.

6.2 Issued Energized Work Permits.

7. References

7.1 BNL ES&H Standard section 1.5.0

7.2 C-A-OPM 2.6.1, "Operating Procedure for Lockout/Tagout for the AGS and Booster Rings, During Accelerator Operations".

8. Attachments

8.1 C-A-OPM-ATT 2.6.2.a, "Energized Circuit Work Permit - AGS and Booster Enclosures".

8.2 C-A-OPM-ATT 2.6.2.b, "Personnel That May Enter a Ring For Inspections when Energized Circuit Work Permits are Required".